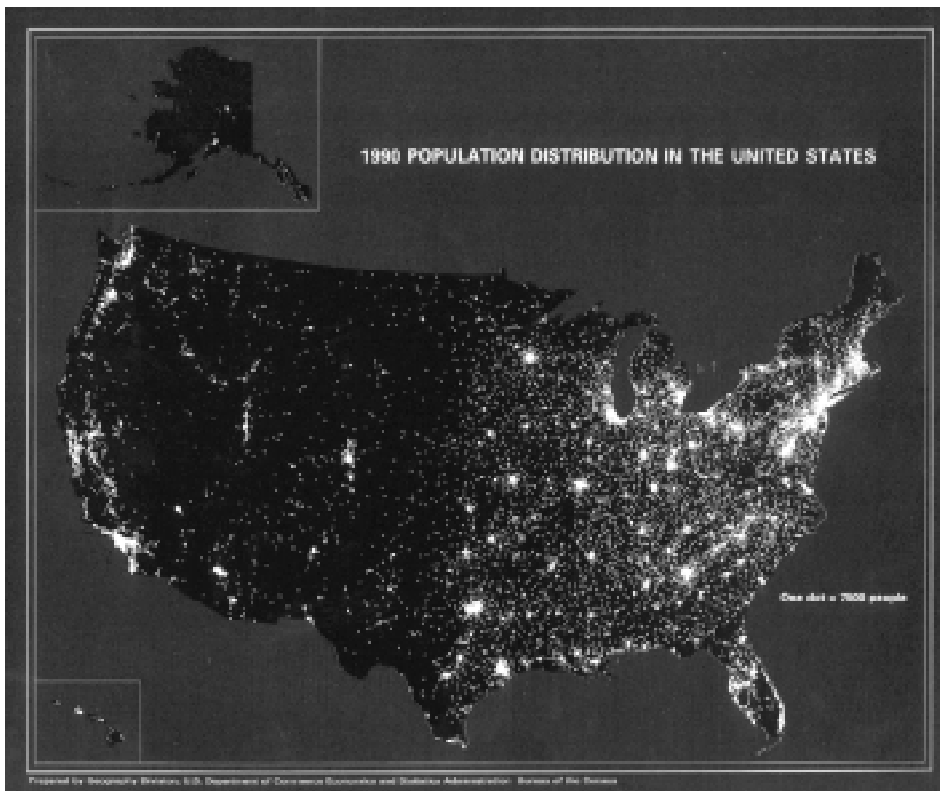


LOICZ and NODC share common waters

LOICZ program and National Oceanographic Data Center add to knowledge of coastal processes



▲ Figure 1. The "Nighttime Map" as prepared by the U.S. Bureau of the Census clearly shows the large concentration of population along the U.S. coasts.

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The Land-Ocean Interactions in the Coastal Zone (LOICZ) program and the National Oceanographic Data Center (NODC) synergistically are opening the ports to a greater understanding of our planet's coastal regime. Global-scale investigations of the open oceans and atmosphere have been given high priority by the international scientific community over the past two decades. The Tropical-Ocean Global-Atmosphere (TOGA) program laid the observational ground work and initiated an immense increase of our understanding of large-

scale ocean-atmosphere interaction. While TOGA focused primarily on the tropical oceans, the World Ocean Circulation Experiment (WOCE) spread the observational network throughout the global oceans and has provided an extraordinary snapshot of the behavior of the oceans during the 1990s through a vast variety of measuring and modeling schemes. The TOGA and WOCE programs have concentrated mostly on physical characteristics of the oceans.

Contemporaneous with WOCE, the Joint Global Ocean Flux Study (JGOFS), has focused on biological and geochemical components of ocean-atmosphere interaction. JGOFS has demonstrated the colossal role of the oceans in maintaining Earth's balance of geochemical properties through dynamical and biological interactions and has given us clues to the extent of potential greenhouse warming by means of a better understanding of the ocean's role in carbon cycling. It is inherently obvious that the next logical domain of study be focused on the coastal regimes to

quantify the significance of the fluxes of properties from land into the open waters. This, of course, is the region of the world ocean most affected by both immediate human activities at the coast (Figure 1) and by the hydrological "signal amplification" as land-based climate changes are imposed on the coast. Dealing with this region is the primary goal of LOICZ.

Since the beginning of 1997, the NODC has aimed significant attention to the task of identifying and acquiring data from the coastal regimes, building the framework for efficient management and distribution of a long-term central archive, and ensuring the approval of the scientific, educational, commercial, and public coastal ocean communities through a series of workshops. One of the conclusions of these workshops was the need for cooperation and collaboration with large scientific research programs.

What is LOICZ?

The Land-Ocean Interactions in the Coastal Zone is the core project of the International Geosphere-Biosphere Programme (IGBP) of the International Council of Scientific Unions (ICSU) that focuses on the area of the earth's surface where land, ocean, and atmosphere meet and interact (Pernetta and Milliman, 1995). The general goals of this multinational and multidisciplinary project are to determine at regional and global scales: 1) the nature of the dynamical interaction of the land-air-ocean interface; 2) how these interactions affect the coastal zones and the role of the effects on global cycles; 3) to assess the anthropogenic influence; and 4) to provide a sound scientific basis for sustainability of the coastal regimes.

This ten-year project commenced in 1993 with the establishment of the International Project Office (IPO) at the Netherlands Institute for Sea Research (NIOZ), Texel. The IPO, through guidance of the LOICZ Scientific Steering Committee (SSC), coordinates over 2000 nationally-funded scientists in 130 countries by providing a central

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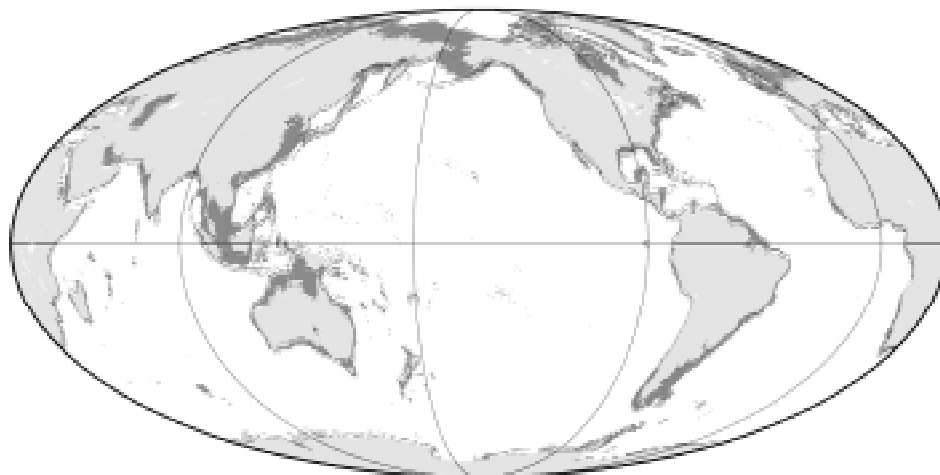
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World Wide Web page (<http://www.noiz.nl/loicz/welcome.html>) and the publication of a quarterly newsletter, which can be downloaded from their web site.

Much of the LOICZ research is being carried out by a distributed network of coastal zone researchers. National LOICZ contacts have been identified in many countries to provide a linkage between national and international LOICZ research activities. These people provide a first point of contact for persons interested in getting additional information on local and national LOICZ research.

One of the principal oceanographic elements of LOICZ is the joint JGOFS/LOICZ Continental Margins Task Team (CMTT) which has been established to promote and coordinate research on fluxes across the continental margins (Figures 2 and 3) from land to the open ocean. One of the necessary steps of this objective is to develop a typology of coastal regimes to quantify parameters for models. This involves selecting regions with adequate observational information that have common characteristics with other locations that do not. For each type, geochemical property budgets within adjacent estuaries are defined and fluxes into the coastal



▲ **Figure 2.** Coastal shelf regions are highlighted for depths less than 100 m (grey) and between 100 and 200 m (black) as derived from the ETOPO5 data set (National Geophysical Data Center). The depths less than 200 m represent roughly 7.6% of the global ocean, while depths less than 100 m have about 6.5%. These considerations are important in defining the boundaries of the coastal regime.

waters are estimated to determine the resulting flux across the shelf and into the open ocean. These, in turn, will support global modeling efforts of various parameters, such as the highly important carbon cycle.

The success of this task requires the direct availability of and ready access to data and data products derived from a vast spectrum of measurements and model output. Since the LOICZ program does not have a specific observational component, the program requires access to existing data sets, such as from the coastal modules of the Global Ocean Observing System (GOOS) or the Global Oceans Ecosystems Dynamics (GLOBEC) experiment. The cooperation of various national and international data centers and research agencies as well as the open exchange among individual scientists are crucial considerations of

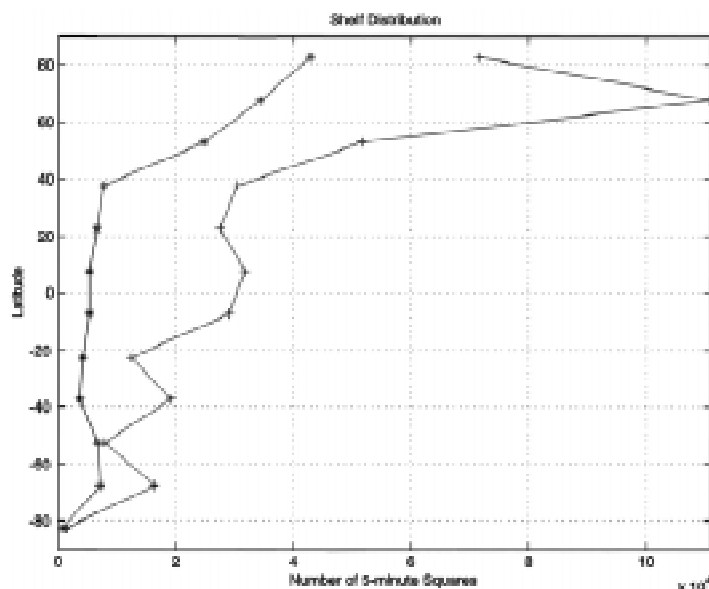
LOICZ scientists. The LOICZ IPO has initially approached this task by creating a web page with links to online data sets. However, the program would benefit greatly if a more unified effort was undertaken for centralizing or linking distributed coastal data systems.

The NODC coastal data initiative

NODC holds a variety of coastal ocean data sets (Hamilton, 1997), although primarily of the physical oceanographic type. Several of these have overlap with the open ocean such as the Profile Database (temperature, salinity, nutrients, and other parameters measured in the water column at a specific site and time), the Marine Environmental Buoy Data set, current motion sets as measured at fixed locations and from shipboard Acoustic Doppler Current Profilers, and remote sensing archives, such as CoastWatch.

Other data sets are exclusively coastal, such as the real-time online beach temperature reports, the Coastal Environmental Assessment Data (a selection of multi-disciplinary data collected in the 1970s and 1980s at a few specific sites), and the Joint Archive for Sea Level (JASL), a collaboration of NODC with the University of Hawaii Sea Level Center through the support of the regional NODC liaison. The JASL is the largest collection of research quality hourly, daily, and monthly values from

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▲ **Figure 3.** The distribution of shelf depths as a function of latitude also shows the depths less than 100 m (+) to represent a much greater area than depths between 100 and 200 m (*). About 67% of the world's shelf lies north of the Equator and 86% lies north of 30°S, coinciding closely with the distribution of human populations.

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over 350 sites globally (Caldwell and Merrifield, 1997).

Although the NODC's holdings are significant, a large number of coastal data sets remain at large within the control of other national, state, and local agencies as well as various research organizations affiliated with universities, beneficiary arrangements, or private consulting firms. These represent a diverse collection of information on a variety of temporal and spatial scales and among the various disciplines. The NODC director, Dr. Henry Frey, has given very high priority to resolving how best to approach the coastal oceanographic data management issue.

One of his first steps was to listen to the needs of the coastal oceanographic community. In March of 1997, over 100 scientists attended the first NODC Coastal Data Workshop (NOAA, 1997) to share experience pertinent to the NODC's approach to the prioritization, archival, and management of coastal data and information. The response was tremendous and a list of recommendations was compiled for various aspects related to data acquisition, quality control, management, products, and distribution. As a follow-up, working groups were assembled in October 1997 (NODC, 1997) to focus on these recommendations. One of the conclusions of this workshop was the need to collaborate with large research programs.

Mutual support

The cooperation between LOICZ and NODC provides great benefit to each. NODC has offered help with three primary activities: 1) exposure of the LOICZ program through publications such as the Earth System Monitor; 2) links to the LOICZ web site from the NODC home page (under construction); and 3) acquisition, management, and distribution of global multidisciplinary coastal data.

Assistance is also being provided by the NODC Hawaii-based liaison, Mr. Patrick Caldwell, through collaboration with Dr. Stephen V. Smith, who was co-chairman of the LOICZ CMTT, a member of the LOICZ SSC, and a professor within the School of Ocean and Earth Science and Technology at the Univer-

sity of Hawaii. The NODC presently serves LOICZ as a resource of data and information through the existing archive and as a link to the other NOAA national data centers.

NODC's initiative of coastal data management can be greatly supplemented through the scientific guidance of the LOICZ. Scientific overview in the development of an archive system is essential for many reasons, such as the determination of which data and metadata are critical for saving, the maintenance of sufficient significant figures of the values, guidelines for quality control, the organization of this information in the most logical way for efficient storage and retrieval, and suggestions of desirable products. The LOICZ scientist can also be a valuable resource for contributions of data to the NODC or for referrals to other data holders.

By the year 2010, of the 20 predicted megacities, all but one will be in the coastal regime. The increased population will create greater stress on the environment and require definitive scientific guidance if sustainable development is to be a priority. Moreover, scientists are struggling to understand the important role of the ocean as a carbon sink for estimating global climate change. The LOICZ program and the NODC are both striving to support these tremendously important challenges, and by working together, have a much greater chance of success.

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